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Loureiro Engineering Associates, Inc.

June 17, 1999

US Environmental Protection Agency
JFK Federal Building (HBT)
1 Congress Street
Boston, MA 02114

Attn.: Juan Perez

RE: Summary Investigation and Remediation Report - Airport/Klondike Area
Pratt & Whitney, East Hartford, Connecticut
LEA Comm. No. 68VG311

Dear Mr. Perez:

Attached please find four copies of additional information for the above-mentioned report for the Airport/Klondike Area at the Pratt & Whitney facility located at 400 Main Street in East Hartford, Connecticut. The information provided in this package includes the following:

- Technical Memorandum 17 Soil Vapor Extraction (New)

The information identified as "New" has not been previously submitted for review. This TM should be added to Volume III of the Technical Memoranda Binders. The information has been separated into four bundles, each complete with a copy of this letter and the above-mentioned information.

If you have any questions or comments concerning the attached information, please contact me at 860-747-6181.

Sincerely,

LOUREIRO ENGINEERING ASSOCIATES, INC.

Thomas J. Salimeno, P.E.
Senior Project Manager

Attachments

pc: V. Riva, Pratt & Whitney

DRAFT

TECHNICAL MEMORANDUM 17
SOIL VAPOR EXTRACTION

SUMMARY
SITE INVESTIGATION AND REMEDIATION REPORT
AIRPORT/KLONDIKE AREA
AT
PRATT & WHITNEY
EAST HARTFORD, CONNECTICUT
EPA ID No. CTD990672081

Prepared for:

PRATT & WHITNEY
400 Main Street
East Hartford, Connecticut 06108

Prepared by:

LOUREIRO ENGINEERING ASSOCIATES
100 Northwest Drive
Plainville, Connecticut 06062

LEA Comm. No. 68V8124

DRAFT

Table of Contents

DRAWINGS

TABLES

ATTACHMENTS

DRAFT

Acronyms

AEL	Averill Environmental Laboratory, Inc.
cfm	cubic feet per minute
CFR	Code of Federal Regulations
DEP	State of Connecticut Department of Environmental Protection
DPH	State of Connecticut Department of Public Health
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
LDPE	Low-Density Polyethylene
LEA	Loureiro Engineering Associates, Inc.
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
P&W	Pratt & Whitney
PE	Performance Evaluation
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QUANT	Quanterra Environmental Services, Inc.
RCSA	Regulations of Connecticut State Agencies
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
TM	Technical Memoranda
TPH	Total Petroleum Hydrocarbons
USTM	Unit-Specific Technical Memorandum
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
VCAP	Voluntary Corrective Action Program
VOC	Volatile Organic Compound
VPSA	Virgin Product Storage Area

1. INTRODUCTION

1.1 Purpose and Objective

This Technical Memorandum (TM) presents the procedures, methodology and results of the full-scale soil vapor extraction (SVE) pilot study that was conducted for remediation of contaminated soil in Storage Area 3 of the Virgin Product Storage Area (VPSA) of the South Klondike Area at the Airport/Klondike Area (Site) of the Pratt & Whitney (P&W) facility located at 400 Main Street (Main Street facility) in the Town of East Hartford, Connecticut. The SVE pilot study was performed as part of the Site investigation and remediation activities to evaluate the potential utility of SVE for the remediation of volatile organic compounds (VOCs) known to be present in Storage Area 3.

1.2 Background

The Airport/Klondike Area is located on the eastern portion of the P&W Main Street facility on the east side of the main plant, north of Brewer Street and south of Silver Lane. The Airport/Klondike Area consists of four study areas that include the North and South Airport Areas and the North and South Klondike Areas. Previous investigations at the Site performed from 1989 through 1993 resulted in the installation and sampling of soil borings, groundwater monitoring wells, and temporary wellpoints throughout the Airport/Klondike Area.

Storage Area 3 was one of six former storage yards, numbered from north to south, in the western portion of the VPSA. Each yard was approximately 200 feet by 400 feet in size, and was partially paved. These former storage areas were operated from approximately 1960 to 1993. Based on historical information, including aerial photographs, each of the storage areas had a different use and history.

Storage Area 3 consisted of a former outdoor storage area for drums of waste products, salvage vehicles, trays/chutes (apparently for the drying and transporting of machine parts), outdoor overhead lamp posts and fixtures. Storage Area 3 was used for the storage of waste products which likely included solvents, jet fuels, hydraulic and lubricating oils, calibration fluids, and cutting oils. The solvents may have included: tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), methanol, toluene (TL), methylene chloride, acetone, and methyl ethyl ketone.

From aerial photographs for the period of 1968 to 1970, drums were observed to be stored upright and stacked on their sides within Storage Area 3. Staining of the area was observed from these same photographs. From aerial photographs for the period from 1977 through 1987, the area was used for the storage of packing crates and various pieces of equipment.

1.3 Scope

This TM covers the procedures, practices, rationale, and results of the methods employed during the SVE pilot study conducted in the Airport/Klondike Area. The methods and techniques discussed are those used by Loureiro Engineering Associates, Inc. (LEA) during the period from approximately December 1993 through September 1994. This TM does not cover the specific environmental investigations conducted before or after the pilot study, as these data are discussed in the Virgin Products Storage Areas 1 through 6 Unit-Specific Technical Memorandum (USTM).

1.4 General Geologic and Hydrogeologic Conditions

The geologic and hydrogeologic characteristics of the Site are discussed in detail in the main body of this report. In general, the surficial materials in which the majority of the soil vapor survey points were completed, consist of medium to fine grained sands with trace levels of fine gravels and coarse sands. These sediments are generally post-glacial, fluvial deposits associated with the Connecticut River, although in many places the upper portion of these sediments have been anthropogenically disturbed during on-site construction activities. Beneath the fluvial sediments are glaciolacustrine sediments, primarily laminated silts and clays, associated with glacial Lake Hitchcock. The basal sediment layer over most of the area is glacial till and stratified drift. Bedrock in the general East Hartford area consists of Triassic Age, interbedded arkoses and basalts. Bedrock in the area has a general slight dip eastward cut by widespread steep faults.

The regional drainage basin is the Upper Connecticut River Basin. Regional flow in the unconsolidated materials in this part of the basin is to the west, towards the Connecticut River. Local groundwater flow is also controlled by local drainage sub-basins and topography. The upper portion of the unconsolidated sediments serves as the primary aquifer in the area. Groundwater flow in the bedrock is primarily within fractures and fault planes, and to a lesser extent within the rock matrix. The local bedrock aquifer would be adequate as a residential water supply source, but groundwater yields are typically too low to be of commercial or industrial use and the local groundwater quality is classified as GB and therefore would not be appropriate as a drinking water source.

2. METHODOLOGY

This section presents the methods and techniques used to install, operate, and monitor the SVE system in Storage Area 3 of the VPSA in the South Klondike Area at the Site. These methods were used by LEA during the period from approximately December 1993 through September 1994.

SVE is a remediation technique that consists of the removal of volatile contaminants from the unsaturated soil zone by extracting air from the soil matrix through the application of a vacuum. As the air is removed from the soil, it carries with it the volatile contaminants which may be subsequently treated and removed from the air, thereby reducing the concentration of those contaminants in the soil. The contaminants in the unsaturated-zone soils volatilize to the vapor phase for vacuum removal and over time, the concentrations or contaminants in the soil are reduced.

The SVE system installed in Storage Area 3 included the installation of SVE wells designed to provide effective coverage of the area and maximize the flow of contaminated air from the soil, the installation of vapor probes to allow the effectiveness of the operation to be monitored, and a vacuum/air treatment system.

2.1 Historical Investigations

Storage Area 3 of the VPSA was historically used for the storage of waste materials and virgin chemical products. A soil gas survey performed in December 1989 by Target Environmental Services, Inc. (Target) identified the potential for significant concentrations of chlorinated solvents within the general vicinity. Based upon the results of the environmental investigations, Storage Area 3 was identified as requiring additional investigations by Westinghouse Environmental and Geotechnical Services, Inc. (Westinghouse) in the *Preliminary Reconnaissance Survey of the Klondike Area* (Westinghouse, 1990).

In 1992, Metcalf & Eddy, Inc. (M&E) installed a series of soil borings and well points to provide groundwater quality information throughout the VPSA (M&E, 1994). Analytical data from soil and groundwater samples collected from these borings and well points indicated a possible source of chlorinated and aromatic solvents within Storage Area 3. In addition, selected metals and polychlorinated biphenyls (PCBs) were identified in the general location of the VPSA and Storage Area 3, specifically.

2.2 Soil Vapor Extraction System

Based upon the presence of chlorinated VOCs, and P&W's anticipated final corrective measures for the South Klondike Area at the time, LEA was tasked with designing, installing, operating, and maintaining a full-scale SVE system in Storage Area 3.

2.2.1 Soil Vapor Extraction System Design and Installation

The SVE system installed in Storage Area 3 included five vapor extraction wells, SK-VEW-01 through SK-VEW-05, adapted to provide effective air removal properties for the unsaturated zone, as well as effective coverage of the area undergoing remediation. The SVE wells were designed to provide areas for vapor flow to approximately the ground surface, while allowing for a sufficient seal at the surface to prevent short-circuiting the intended air flow from the subsurface.

The five SVE wells were located so as to provide the maximum areal coverage of Storage Area 3. The location of the SVE wells are shown on Drawing TM17-1. In order to evaluate the effectiveness of the SVE well placement, and the overall operation of the SVE system, seven vapor probes, SK-VP-01 through SK-VP-05 were installed to evaluate the vacuum levels achieved in the study area. The location of the vapor probes are also shown on Drawing TM17-1.

Due to the shallow depth of the VOC contamination and the lack of a continuous surface cover, such as asphalt, a low-density polyethylene liner (LDPE) was placed over the study area to minimize precipitation infiltration and airflow short-circuiting. A 0.030-inch, or 30-mil, thick, LDPE cover was placed over the study area. The cover location, shown on Drawing TM17-1, covered an area of approximately 130 feet by 185 feet, or 24,050 square feet. The LDPE liner was laid over the area and secured to the ground with weights consisting of bags of cement. The liner was pierced to allow the vapor probes and SVE wells to protrude for access. All of the piping, valves, and fittings connecting the SVE wells to the vacuum system was placed above ground to avoid the necessity of disturbing the liner in the event that maintenance was required.

The extraction system consisting of a positive displacement blower, vapor-phase carbon, and the associated piping were located in an enclosure adjacent to Storage Area 3. These systems were housed so as to protect the systems from the elements and to provide storage for additional and spare components which may be required.

The five SVE wells were constructed of 0.040-inch slotted 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) well screen placed from 1.5 to 15.0 feet below the ground surface, and 2-inch diameter, Schedule 40 PVC well riser brought to approximately 1.5 feet above the ground surface. The borehole annulus was backfilled with coarse sand around the slotted section of pipe and a bentonite/cement grout cap was placed above the sand. A 1.5-foot thick concrete collar was poured at the surface. The design of the SVE wells was intended to present the maximum possible open area to the unsaturated zone in order to provide for maximum air flow during operation.

Seven vapor probes were installed in Storage Area 3 in order to provide monitoring points during SVE operation. The vapor probes consisted of 0.25-inch diameter stainless steel probe rods with slotted or drilled tip section. The probes were installed to a depth of 2.0 feet below the ground surface, the borehole was backfilled with coarse sand, and the boreholes were capped and sealed with bentonite/cement grout and cement collars in an analogous manner to the SVE wells. The vapor probes were equipped at the top with a valve and a fitting to allow connection to the sampling equipment for routine monitoring.

After installation, the SVE wells were connected to the extraction system with a valved manifold and a vapor-liquid separator. A schematic of the SVE system is shown on Drawing TM17-1. Because of the high vacuum induced by the blower, and the shallow depth to groundwater in the South Klondike Area, it was inevitable that some quantity of groundwater and some volume of soil moisture would be extracted along with the soil vapor. The extraction system discharged the vapors to activated carbon canisters which adsorbed the contaminants. The vapor-liquid separator was installed to minimize the volume of water passing through the system and thereby minimize the liquid loading onto the activated carbon. Monitoring points along the vapor flow path allowed monitoring of influent and effluent air quality.

2.2.2 Soil Vapor Extraction System Operation

The SVE system was placed into operation on March 8, 1994. On March 18, 1994, during routine system monitoring, it was discovered that the groundwater levels had risen resulting in decreased vapor removal and increased groundwater removal. On March 25, 1994, system monitoring data indicated that the groundwater levels had risen significantly and had thereby reduced the efficacy of the system substantially. The system was shut down on March 25, 1994 to await a decrease in groundwater levels. Eventually, the groundwater level receded, providing sufficient unsaturated-zone soils for treatment. The system was restarted on July 20, 1994 to continue the operating period until shutdown on September 26, 1994.

2.2.3 Soil Vapor Extraction System Monitoring

During the periods when the SVE system was operational, periodic routine monitoring was performed in order to evaluate the operation and performance of the system. The factors included in the routine monitoring included vacuum levels and contaminant concentrations in soil vapor at each of the vapor probes, vacuum levels, groundwater levels, flow rates, and contaminant concentrations in soil vapor at each of the SVE wells, the flow rate and VOC concentrations of the vapor discharges from the positive displacement blower.

Monitoring of the SVE system consisted of the following:

- At the SVE well the flow rate of the extracted soil vapor was measured using a sharp-edge orifice plate combined with a differential pressure gauge. Vacuum measurements were made with the use of a diaphragm-type differential pressure gauge, and groundwater levels were measured using an electronic water level indicator.

- Vapor samples for VOC concentration measurements were collected with the aid of a soil-gas sampler which consisted of an air-sampling pump and a rotameter. The soil-gas sampler was used to purge the sampling point at a rate of approximately 2 liters per minute for at least three minutes. After purging, a 1-liter Tedlar® bag was attached to the soil-gas sampler output and a vapor sample was collected. The collected vapor samples were returned to the LEA Analytical Laboratory for analysis. The details of the analysis of the vapor samples are discussed in *TM 7, Loureiro Engineering Associates Analytical Laboratory.*

Monitoring was performed on twenty separate occasions in the period between March 8, 1994 and September 26, 1994. Data for these monitoring events is included in Attachment A.

2.2.4 Soil Vapor Extraction System Shut-Down and Removal

On September 26, 1994, the SVE system was permanently shut down with the completion of the pilot study. Subsequent to the shut down, all exterior piping, the LDPE cover, the vacuum blower and carbon canisters were removed from the Site. The SVE wells were originally capped, but were later removed, along with the vapor probes, during the soil excavations discussed in the *TM 11, Containment Building Construction and Operation.* At the present time, none of the SVE system remains.

2.3 Soil Vapor Extraction System Performance Evaluation

Evaluation of the performance of the SVE system was based on the total volume of VOCs removed, and an evaluation of the effective area of remediation as compared to the area of contamination. Concentrations of VOCs were calculated on the basis of the routine monitoring data collected during system operation.

Based upon the measured air flow volumes, operation times, and VOC concentrations, estimates were made of the total volume of solvents recovered by the SVE system. Using the blower flow rate of 80 cubic feet per minute (cfm) and the above information, an estimate of 2,100 pounds of VOCs were estimated to have been removed during the 74 days of system operation. The removal estimate can be affected by various factors, including the removal of other constituents and variations in the vapor concentration.

The radius of influence, as an indicator of the area being exposed to air flow, was established by the vacuum measurements at the vapor probes and SVE wells. The radius of influence of the system was represented by the inferred vacuum contour which exhibited a vacuum level of approximately one percent of the vacuum level imposed on the nearest SVE well. An estimate of the area adequately effected by the SVE system was calculated on the basis of the portion of Storage Area 3 where the soil vacuum level induced by the SVE system was 0.3-inches water gauge. This area was extrapolated from the gauged vacuum levels as recorded during the routine system monitoring. The area inferred to have been significantly influenced by the SVE system is illustrated on Drawing TM17-1.

Unfortunately, the heterogeneity of the soils in the area, specifically the presence of silt and clay, limits the overall effectiveness of SVE in the remediation area. In situations where contaminants are contained in silts or clays, the overall remediation is limited by the removal of these soils. These soils with lower permeabilities are subjected to lower airflows, and therefore not remediated as quickly as more permeable soils.

As expected, shallow groundwater was also encountered in the treatment area. However, the overall rise of the groundwater levels particularly during the spring months was somewhat unexpected. In any event, to remediate the VOC contamination of the unsaturated-zone soils, dewatering of the treatment area must be conducted to provide sufficient unsaturated-zone soils for the effective application of SVE in this situation. With the use of a hydraulic barrier around the area, the area could be isolated permitting the dewatering of the area and allowing remediation with the use of an SVE system. Alternatively, the soils could be excavated and treated in a Containment Building. An evaluation of the use of excavation and treatment of VOC-contaminated soil in a Containment Building viruses the use of SVE for the remediation of VOC-contaminated soil was conducted and indicated that the use of the Containment Building was more effective. Details on the use of a Containment Building are discussed in the *TM 11, Containment Building Construction and Operation.*

2.4 Quality Assurance/Quality Control Samples

Quality Assurance (QA) samples were not collected during the routine system monitoring of the SVE system. Because of the nature of the SVE performance monitoring samples and the sampling system, all sampling equipment was considered adequately purged, rather than decontaminated. The possibility of cross-contamination was considered minimal since the samples were under positive pressure and loss of sample and contaminants to the atmosphere was considered more likely than absorption by other samples. Based on the active nature of the SVE system, the possibility and utility of obtaining accurate duplicate samples was considered minimal and therefore duplicate samples were not collected.

2.5 Sample Location Identifiers

Soil borings, monitoring wells, piezometers, stream gauges, soil vapor extraction wells, soil vapor probes, test pits, surface water, sediment, and concrete chip sampling locations have been provided with location identifiers using a systematic method to prevent duplication of location identifiers. The system of location identifiers provides a relatively easy means of finding the referenced locations on site maps. All parts of the P&W East Hartford facilities, including the Andrew Willgoos Gas Turbine Laboratory, the Colt Street facility, and the Main Street facility, have been divided into twenty-nine study areas. Each of the study areas has been assigned two-letter identifiers based upon the common name for the area. These two-letter designations are presented in Table TM17-1.

In addition, each type of sampling location has been assigned a two-letter designation to identify the major sample type for a given sampling location. The two-letter designations for the various types of sampling locations are also presented in Table TM17-1. Because of the large areas involved, the study areas that encompass the Airport/Klondike Area include the North and South Airport Areas and the North and South Klondike Areas. All monitoring and sampling locations have been given a location identifier based on their location in the Airport/Klondike Area, the type of sampling or monitoring location, and finally a sequential numeric identifier based upon the specific type of location.

2.6 Waste Management

Wastes generated during SVE activities included waste soil from borehole advancement, and spent decontamination fluids. All waste soil generated during borehole advancement was placed in 55-gallon, open-top drums supplied by P&W for subsequent off-site disposal by P&W. All spent decontamination fluids generated during the field activities for the investigation were placed in 55-gallon, closed-top drums supplied by P&W for subsequent off-site disposal by P&W. The drums were labeled, the sample locations contributing to each were listed, and the information tracked to aid in waste characterization and disposal.

2.7 Health and Safety

LEA field personnel installed SVE wells, vapor probes, and SVE equipment, collected soil vapor samples, and performed routine system monitoring in accordance with the LEA Site Health and Safety Plan that was prepared for all of the investigation activities performed at the Site. In general, SVE activities were conducted in modified Level D personal protective equipment (PPE) consisting of safety glasses, surgical or nitrile gloves, steel-toed shoes, and, where necessary, hard hats. Other contractors employed as subcontractors operated in accordance with their specific health and safety plans.

3. RESULTS

Based upon historical observations, the presence of chlorinated and aromatic solvents in Storage Area 3 of the VPSA in the South Klondike, was identified. A full-scale SVE system was installed in Storage Area 3 beginning in December 1993, in order to complete a pilot study of the feasability for SVE to remediate those solvents. The SVE system was operated in March 1994, and from July through September 1994.

A total of five vapor extraction wells and seven vapor probes were installed in Storage Area 3. An LDPE cover was placed over the area to seal the ground surface against air inflow and short-circuiting of the air flow during SVE system operation. The five vapor extraction wells were connected to a vapor/liquid separator, vacuum blower, and a series of activated carbon canisters to extricate the vapor from the soil, separate any groundwater or soil moisture present, and treat the extracted vapor to remove VOCs.

Routine system monitoring was performed to monitor system performance and operation, and provide data to evaluate the effectiveness of the treatment. During the period of operation a total of approximately 2,100 pounds of VOCs were estimated to have been extracted from the unsaturated soils in Storage Area 3. The system was shut down on September 26, 1994 with the completion of the pilot study, and subsequently all vapor extraction wells, vapor probes, equipment and appurtenances have been removed from the Site.

Based on the vacuum levels observed, the SVE system could provide adequate coverage of the portion of Storage Area 3 beneath the LDPE liner. The decreasing vapor concentrations and the monitoring of VOCs clearly show that the system removed the contaminants as designed. The field data indicated that the SVE system could provide for removal of contaminants from the unsaturated-zone soils in Storage Area 3. Unfortunately, the heterogeneity of the soils in the area, specifically the presence of silt and clay, limits the overall effectiveness of SVE in the remediation area. In situations where contaminants are contained in silts or clays, the overall remediation is limited by the removal of these soils. These soils with lower permeabilities are subjected to lower airflows, and therefore not remediated as quickly as more permeable soils.

As expected, shallow groundwater was also encountered in the treatment area. However, the overall rise of the groundwater levels particularly during the spring months was somewhat unexpected. In any event, to remediate the VOC contamination of the unsaturated-zone soils, dewatering of the treatment area must be conducted to provide sufficient unsaturated-zone soils for the effective application of SVE in this situation. With the use of a hydraulic barrier around the area, the area could be isolated permitting the dewatering of the area and allowing remediation with the use of an SVE system. Alternatively, the soils could be excavated and treated in a Containment Building. An evaluation of the use of excavation and treatment of VOC-contaminated soil in a Containment Building viruses the use of SVE for the remediation of VOC-contaminated soil was conducted and indicated that the use of the Containment Building was more effective. Details on the use of a Containment Building are discussed in the *TM 11, Containment Building Construction and Operation*.

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Facility Name: PRATT & WHITNEY (MAIN STREET)

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Document Title: DRAFT, TECHNICAL MEMORANDUM 17 SOIL VAPOR EXTRACTION, SUMMARY SITE INVESTIGATION AND REMEDIATION REPORT - AIRPORT/KLONDIKE AREA (06/17/99 TRANSMITTAL LETTER ATTACHED)

Date of Document: 01/01/0001

Document Type: REPORT

Purpose of Target Sheet:

[X] Oversized [ ] Privileged

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Comments:
DRAWING TM17-1: SOIL VAPOR EXTRACTION SYSTEM LOCATION AND SYSTEM DETAILS

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TABLES

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Table TM17-1 Area and Sampling Type Identifiers Airport/Klondike Areas, Pratt & Whitney, East Hartford, Connecticut			
Area Designation	**Area**	**Sampling Type Identifier**	**Explanation**
AB	Within A Building	MW	Monitoring Well
BB	Within B Building	PZ	Piezometer
CB	Within C Building	SW	Surface Water
DB	Within D Building	SD	Sediment
EB	Within E Building	CC	Concrete Chip
FB	Within F Building	SS	Surface Soil
GB	Within G Building	SB	Soil Boring
HB	Within H Building	TP	Test Pit
JB	Within J Building	PES	Performance Evaluation - Soil
KB	Within K Building	PEW	Performance Evaluation - Water
LB	Within L Building	SPB	Soil Boring: Proposed for Remediation
MB	Within M Building	SRB	Soil Boring: Remediated
CS	Colt Street Facility	VEW	Vapor Extraction Well
EA	Engineering Area	VP	Vapor Probe
ET	Experimental Test Airport Laboratory		
LM	Area Outside Buildings L and M		
NA	North Airport Area		
NT	North Test Area		
NW	North Willgoos Area		
PH	Powerhouse Area		
SA	South Airport Area		
SK	South Klondike Area		
ST	South Test Area		
SW	South Willgoos Area		
WT	Waste Treatment Area		
XT	Experimental Test Area		

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ATTACHMENT A

Storage Area 3
Soil Vapor Extraction System Summary Operation Data

Pratt & Whitney
East Hartford, Connecticut

SOUTH KLONDIKE SVE SYSTEM
VEW-01

Pratt & Whitney
East Hartford, Connecticut

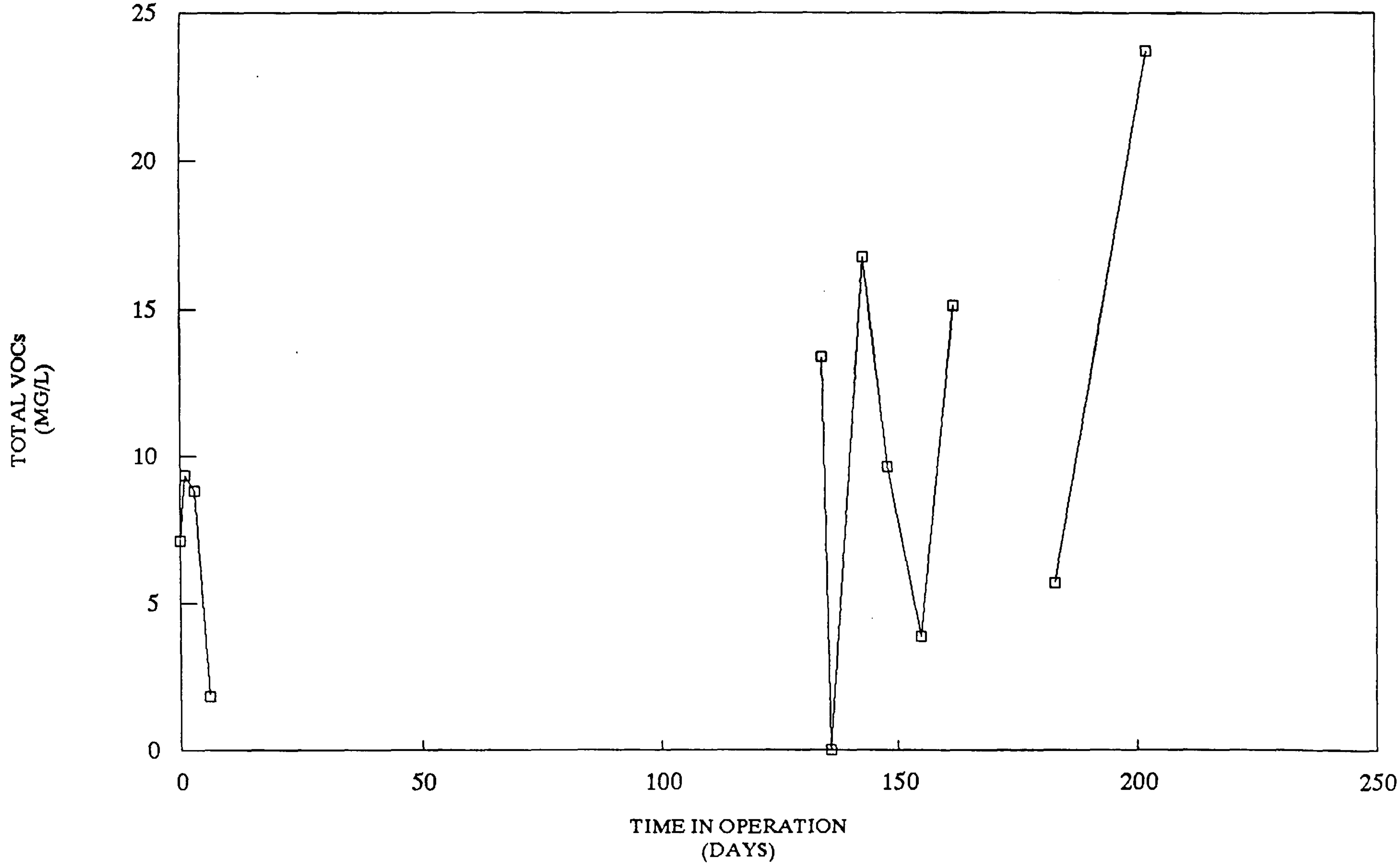
10-Nov-94 02:37 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	01:20 PM		0.08	2,630	ND	4,500	7,130
09-Mar-94	10:50 AM		0.97	2,800	4,970	1,570	9,340
11-Mar-94	12:50 PM		3.06	2,130	4,220	2,460	8,810
14-Mar-94	12:05 PM		6.02	ND	976	843	1,819
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	01:05 PM		134.07	ND<50	3,210	10,200	13,410
22-Jul-94	09:40 AM		135.92	SAMPLE DESTROYED IN TRANSIT			
29-Jul-94	10:15 AM		142.95	ND<50	2,260	14,500	16,760
03-Aug-94	10:40 AM		147.97	116	335	9,180	9,631
10-Aug-94	09:25 AM		154.91	ND	568	3,270	3,838
17-Aug-94	08:25 AM		161.87	622	2,220	12,300	15,142
23-Aug-94	11:48 AM		168.01	SAMPLE DESTROYED IN TRANSIT			
23-Aug-94	12:00 PM	SHUTDOWN	168.02				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:15 AM		182.86	42 E	294 E	5,330 E	5,666 E
26-Sep-94	10:15 AM		201.95	ND<50	1,630	22,100	23,730
26-Sep-94	12:00 PM	SHUTDOWN	202.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data

SOUTH KLONDIKE SVE SYSTEM
VEW–01

Pratt & Whitney
East Hartford, Connecticut



SOUTH KLONDIKE SVE SYSTEM
VEW-02

Pratt & Whitney
East Hartford, Connecticut

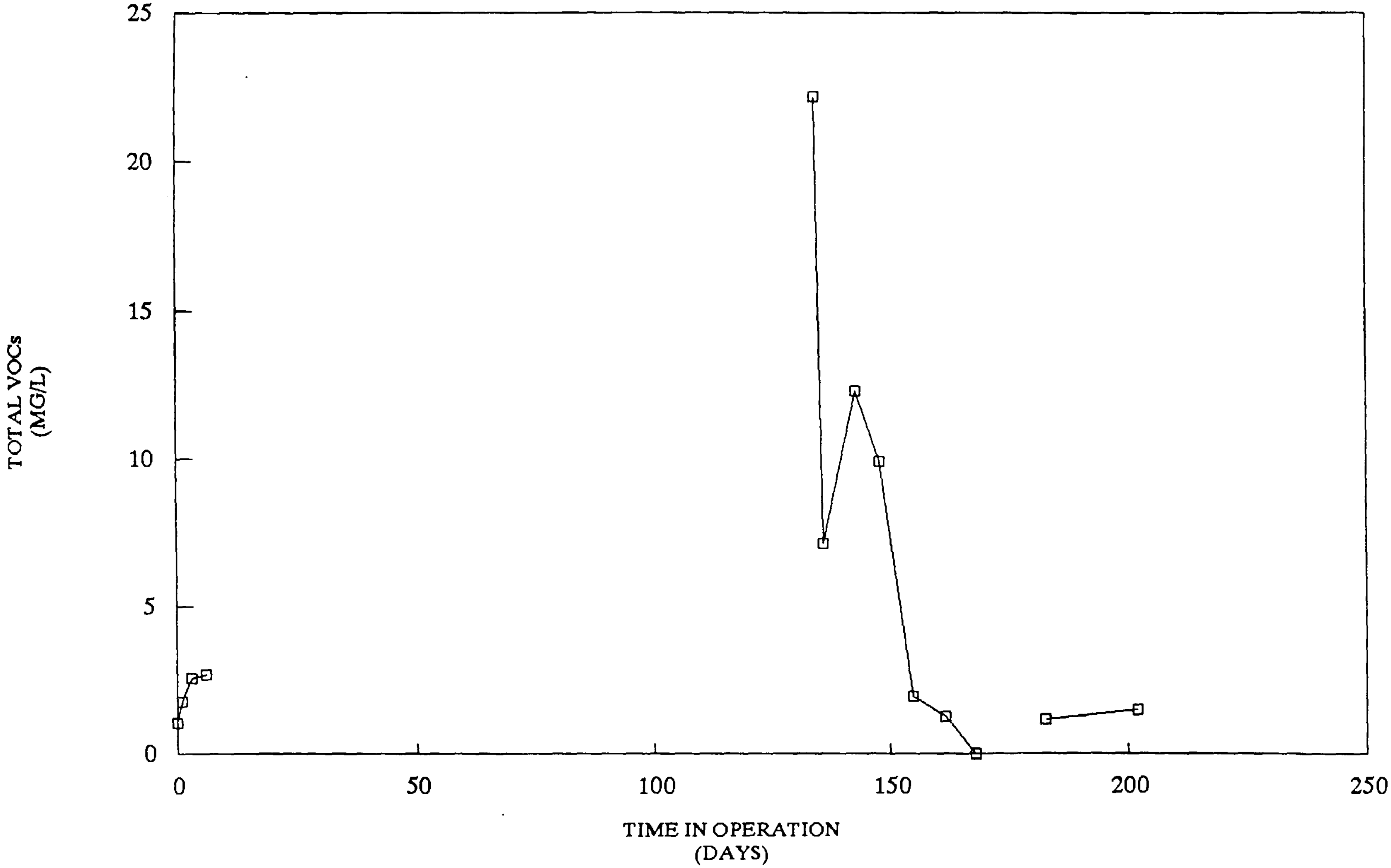
10-Nov-94 01:04 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	01:04 PM		0.07	33	34	1,000	1,067
09-Mar-94	10:55 AM		0.98	ND	10	1,780	1,790
11-Mar-94	12:40 PM		3.05	ND	ND	2,570	2,570
14-Mar-94	12:10 PM		6.03	99	8	2,610	2,717
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	01:00 PM		134.06	ND<50	ND<50	22,200	22,200
22-Jul-94	09:30 AM		135.92	ND<50	ND<50	7,110	7,110
29-Jul-94	10:10 AM		142.94	ND<50	ND<50	12,300	12,300
03-Aug-94	10:35 AM		147.96	106	ND<50	9,790	9,896
10-Aug-94	09:20 AM		154.91	ND	75	1,870	1,945
17-Aug-94	08:20 AM		161.87	ND	25	1,240	1,265
23-Aug-94	11:45 AM		168.01	SAMPLED DESTROYED IN TRANSIT			
23-Aug-94	12:00 AM	SHUTDOWN	179.52				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:20 AM		182.87	ND	ND	1,149	1,149
26-Sep-94	10:10 AM		201.94	ND	ND	1,500	1,500
26-Sep-94	12:00 PM	SHUTDOWN	202.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data

SOUTH KLONDIKE SVE SYSTEM
VEW-02

Pratt & Whitney
East Hartford, Connecticut



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SOUTH KLONDIKE SVE SYSTEM
VEW-03

Pratt & Whitney
East Hartford, Connecticut

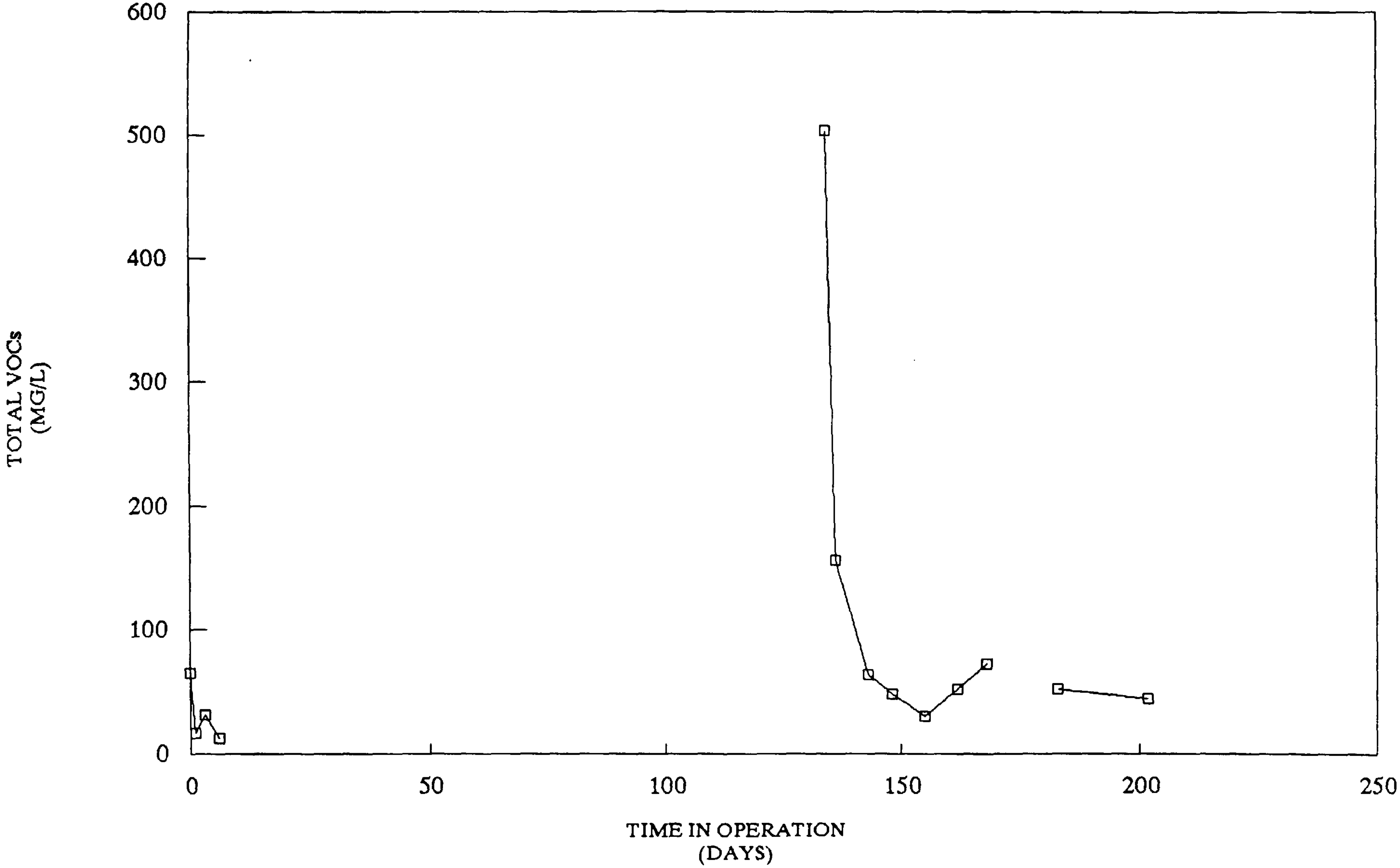
10-Nov-94 02:40 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	01:08 PM		0.07	1,750	ND	64,200	65,950
09-Mar-94	11:00 AM		0.98	974	1,180	14,600	16,754
11-Mar-94	12:30 PM		3.04	1,030	1,190	29,800	32,020
14-Mar-94	12:15 PM		6.03	ND	ND	12,700	12,700
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	12:50 PM		134.06	ND<500	5,910	498,000 E	503,910 E
22-Jul-94	09:25 AM		135.91	ND<500	4,590	151,000 E	155,590 E
29-Jul-94	10:05 AM		142.94	1,010	2,310	60,500	63,820
03-Aug-94	10:30 AM		147.96	3,030	1,790	43,100	47,920
10-Aug-94	09:15 AM		154.91	ND<50	ND<50	30,000	30,000
17-Aug-94	08:15 AM		161.86	3,460	2,320	46,300	52,080
23-Aug-94	11:43 AM		168.01	3,780	2,340	66,200	72,320
23-Aug-94	12:00 PM	SHUTDOWN	168.02				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:25 AM		182.87	1,930	1,285	49,353	52,568
26-Sep-94	10:05 AM		201.94	2,470	1,660	40,400	44,530
26-Sep-94	12:00 PM	SHUTDOWN	202.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data

SOUTH KLONDIKE SVE SYSTEM
VEW-03

Pratt & Whitney
East Hartford, Connecticut



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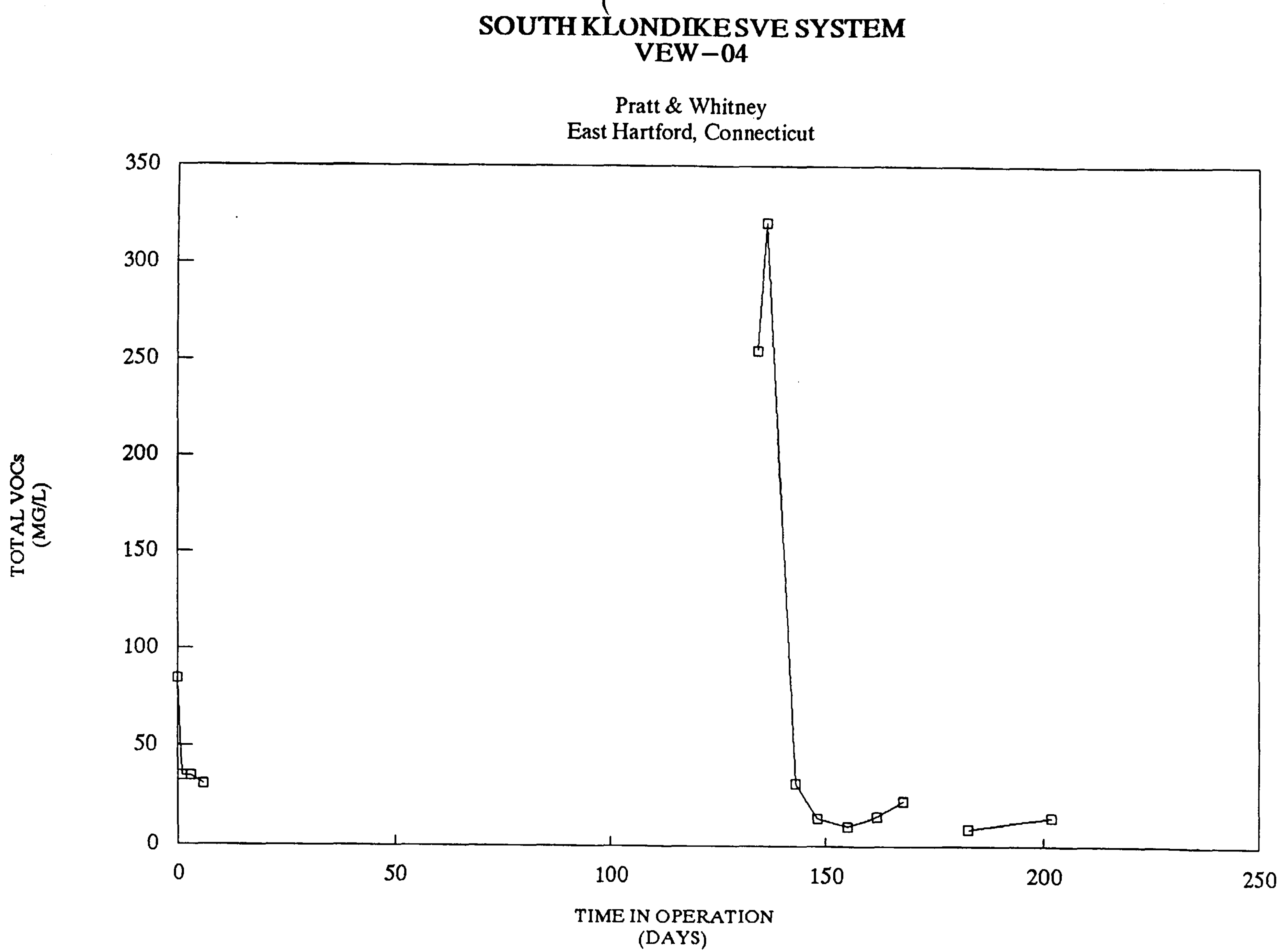
SOUTH KLONDIKE SVE SYSTEM
VEW-04

Pratt & Whitney
East Hartford, Connecticut

10-Nov-94 01:14 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	01:14 PM		0.07	ND	114	84,400	84,514
09-Mar-94	11:05 AM		0.98	ND	141	35,100	35,241
11-Mar-94	01:00 PM		3.06	ND	98	35,200	35,298
14-Mar-94	12:30 PM		6.04	ND	44	30,800	30,844
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	01:10 PM		134.07	89	645	254,000 E	254,734 E
22-Jul-94	09:45 AM		135.93	ND<500	ND<500	321,000 E	321,000 E
29-Jul-94	10:20 AM		142.95	ND<50	ND<50	31,700	31,700
03-Aug-94	10:25 AM		147.95	ND<50	ND<50	14,400	14,400
10-Aug-94	09:05 AM		154.90	ND<50	ND<50	10,500	10,500
17-Aug-94	08:10 AM		161.86	ND<50	43	15,100	15,143
23-Aug-94	11:39 AM		168.01	ND<50	ND<50	23,300	23,300
23-Aug-94	12:00 PM	SHUTDOWN	168.02				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:30 AM		182.88	ND	ND	9,042	9,042
26-Sep-94	10:20 AM		201.95	ND<50	ND<50	14,700	14,700
26-Sep-94	12:00 PM	SHUTDOWN	202.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data


SOUTH KLONDIKE SVE SYSTEM
VEW-04
Pratt & Whitney
East Hartford, Connecticut
TOTAL VOCs
(MG/L)
0
50
100
150
200
250
300
350
0
50
100
150
200
250
TIME IN OPERATION
(DAYS)

SOUTH KLONDIKE SVE SYSTEM
VEW-05

Pratt & Whitney
East Hartford, Connecticut

10-Nov-94 01:17 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	12:57 PM		0.06	1,600	3,020	19,600	24,220
09-Mar-94	11:10 AM		0.99	1,400	3,340	29,100	33,840
11-Mar-94	12:20 PM		3.03	714	1,780	26,600	29,094
14-Mar-94	12:40 PM		6.05	619	1,820	35,200	37,639
18-Mar-94	02:02 PM		10.11	412	768	19,200	20,380
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	12:46 PM		134.05	8,990	13,600	305,000 E	327,590 E
22-Jul-94	09:20 AM		135.91	4,160	10,500	348,000 E	362,660 E
29-Jul-94	10:00 AM		142.94	1,810	2,460	58,100	62,370
03-Aug-94	10:25 AM		147.95	2,140	3,470	40,700	46,310
10-Aug-94	09:00 AM		154.90	147	300	21,500	21,947
17-Aug-94	08:05 AM		161.86	712	534	25,100	26,346
23-Aug-94	11:37 AM		168.00	921	598	48,200	49,719
23-Aug-94	12:00 PM	SHUTDOWN	168.02				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:35 AM		182.88	200 J	562	60,279	61,041
26-Sep-94	10:00 AM		201.94	806	481	37,900	39,187
29-Sep-94	12:00 PM	SHUTDOWN	205.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data

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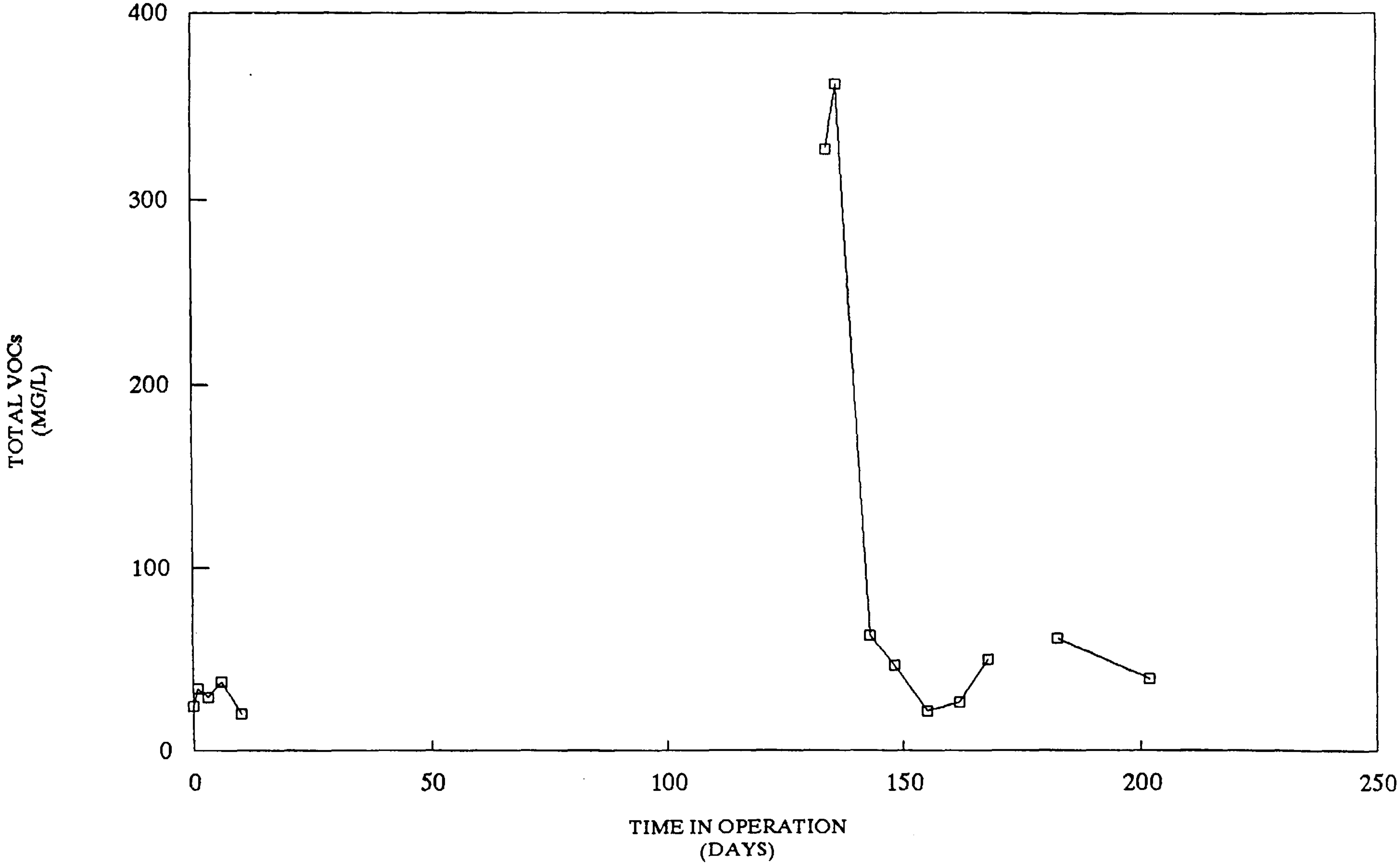
SOUTH KLONDIKE SVE SYSTEM
VEW-05

Pratt & Whitney
East Hartford, Connecticut



SOUTH KLONDIKE SVE SYSTEM
CD-1

Pratt & Whitney
East Hartford, Connecticut

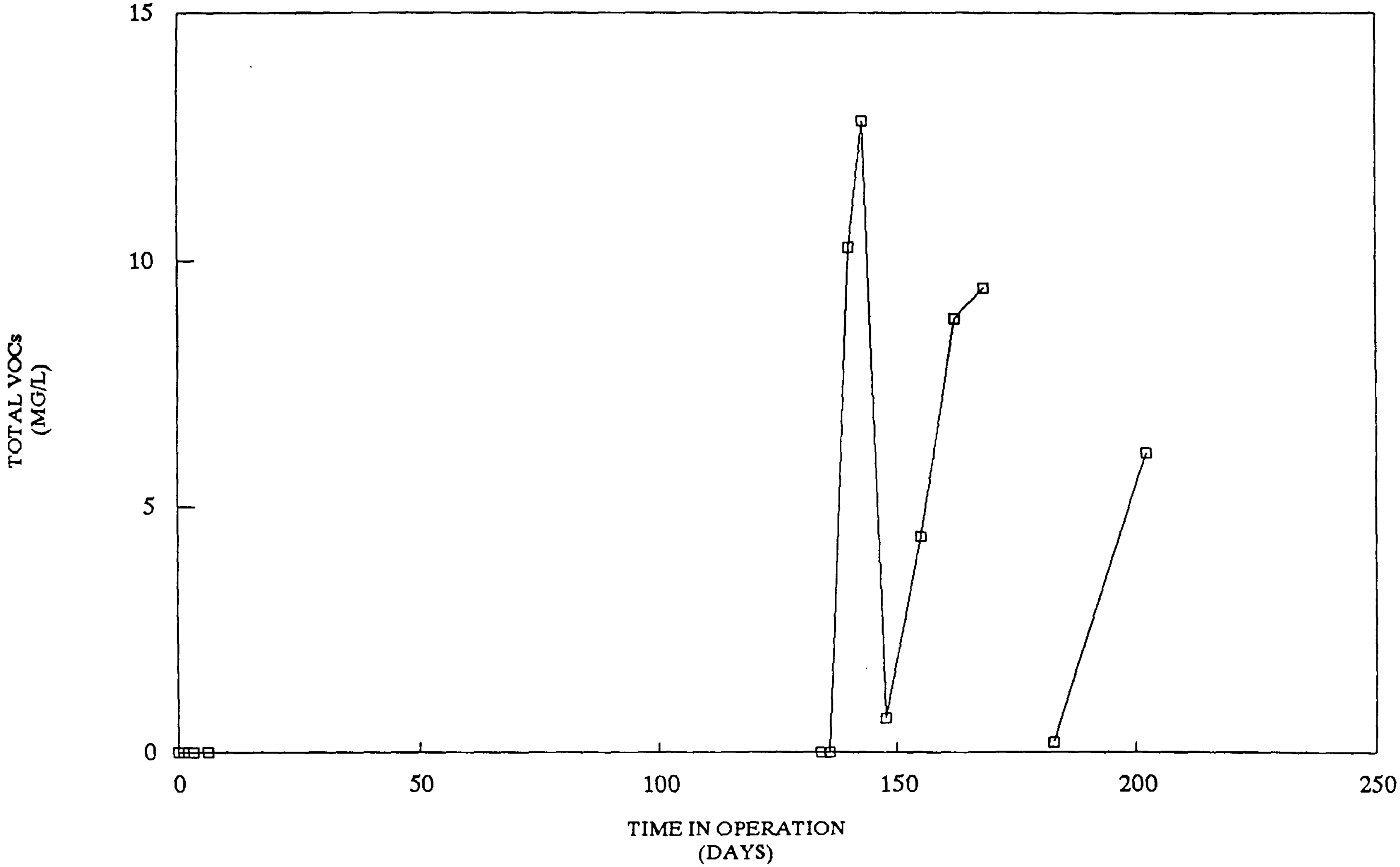
10-Nov-94 12:52 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	12:52 PM		0.06	ND	ND	1	1
09-Mar-94	11:17 AM		0.99	ND	ND	6	6
11-Mar-94	01:08 PM		3.07	ND	ND	ND	ND
14-Mar-94	11:55 AM		6.02	ND	ND	ND	ND
18-Mar-94	02:35 PM		10.13	ND	ND	ND	ND
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	01:10 PM		134.07	ND	ND	1 J	1
22-Jul-94	09:10 AM		135.90	ND	ND	8	8
26-Jul-94	12:15 PM		140.03	182	200	9,900	10,282
29-Jul-94	10:20 AM		142.95	387	126	12,300	12,813
03-Aug-94	10:45 AM		147.97	ND	2 J	705	707
10-Aug-94	09:45 AM		154.93	242	406	3,730	4,378
17-Aug-94	01:10 PM		162.07	159	98	8,570	8,827
23-Aug-94	11:33 AM		168.00	193	139	9,120	9,452
23-Aug-94	12:00 PM	SHUTDOWN	168.02				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:12 AM		182.86	ND<50	ND<50	205	205
26-Sep-94	10:27 AM		201.96	ND<50	ND<50	6,100	6,100
26-Sep-94	12:00 PM	SHUTDOWN	202.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data

SOUTH KLONDIKE SVE SYSTEM
CD-1

Pratt & Whitney
East Hartford, Connecticut



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SOUTH KLONDIKE SVE SYSTEM
CD-2

Pratt & Whitney
East Hartford, Connecticut

10-Nov-94 12:55 PM

DATE	TIME	DAYS FROM INITIAL STARTUP		VAPOR CONCENTRATIONS 1,1,1-TCA (UG/L)	TCE (UG/L)	PCE (UG/L)	Total VOCs (UG/L)
08-Mar-94	12:50 PM		0.06	ND	ND	ND	ND
09-Mar-94	11:20 AM		0.99	ND	ND	2,160 R	2,160 R
11-Mar-94	01:10 PM		3.07	ND	ND	69 R	69 R
14-Mar-94	11:58 AM		6.02	ND	ND	ND	ND
18-Mar-94	02:39 PM		10.13	ND	ND	ND	ND
25-Mar-94	11:45 AM	SHUTDOWN	17.01				
20-Jul-94	12:45 PM	STARTUP	134.05				
20-Jul-94	01:15 PM		134.07	ND	ND	369 R	369 R
22-Jul-94	09:15 AM		135.91	ND	ND	13	13 R
26-Jul-94	12:20 PM		140.03	ND	ND	110	110
29-Jul-94	10:25 AM		142.95	116	ND	79	195
03-Aug-94	10:50 AM		147.97	ND	ND	279	279
10-Aug-94	09:50 AM		154.93	ND	ND	60	60
17-Aug-94	01:15 PM		162.07	215	40	48	303
23-Aug-94	11:35 AM		168.00	51	56	214	321
23-Aug-94	12:00 PM	SHUTDOWN	168.02				
31-Aug-94	12:00 PM	STARTUP	176.02				
07-Sep-94	08:10 AM		182.86	ND<50	ND<50	17	17
26-Sep-94	10:30 AM		201.96	ND	ND	19	19
26-Sep-94	12:00 PM	SHUTDOWN	202.02				

J: Estimated value below detection limit
E: Estimated value above calibration range
ND: None detected, less than 5 UG/L unless otherwise noted
R: Rejected data

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SOUTH KLONDIKE SVE SYSTEM
CD-2

Pratt & Whitney
East Hartford, Connecticut